# DESCRIPTION

The MF-211 system combines DEC's LSI-11/2 with the dual-Shugart SA800 flexible disk drives, all within a 10½" rack mountable enclosure. The CRDS controller provides for dual density operation and complete software/media compatibility with DEC's RX02 floppy disk system. Functionally identical in operation to DEC's 11V03L, the MF-211 can be used in a variety of system applications utilizing any of the RX02 software packages, such as RT11, Fortran, Basic, Pascal, etc. The standard system uses DEC's H9270 4-quad slot backplane with an 8-quad slot backplane available as an option within the same 10½" enclosure!

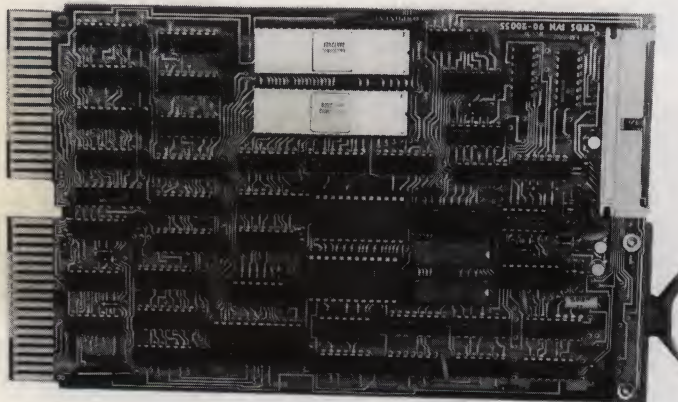## Each Standard MF-211 System Contains:

- KD11HA, DEC LSI-11/2 central processor
- Dual floppy disk system using industry standard Shugart SA800 floppy disk drives having a combined capacity of one million bytes and built-in write-protect.
- A dual-height controller containing all needed electronics for control functions, interface, bootstrap loader (eliminating need for DEC BDV-11AA card), formatter and self-tester; the controller is completely RX02 equivalent, including software and media compatible.
- A 19" rack mountable enclosure having 10½" panel height and front panel switches for:
    - Enable/halt
    - Line time clock
    - Initialize/boot
  Also:
    - —Indicators for "Run" and "DC OK"
    - —Removable front panel
    - —Front access to all PC cards
    - —Rack mountable slides
    - —On-off circuit breaker
- Power supply with needed +5V and +12V power for 4-quad slot or 8-quad slot backplane. Includes options for 110V or 220V, 60Hz or 50 Hz.
- 16K or 32K word MOS memory with self-contained refresh.

## Options Available With MF-211

- Any DEC system component for the LSI 11/2 microprocessor including:
    - KEV-11 Extended Arithmetic Unit
    - DLV-11 Serial Line Unit
    - DLV-11J Quad Serial Line Unit
    - Cables for DLV-11 & DLV-11J
    - DRV-11 Parallel Interface
    - KWV-11A Programmable Clock
- DEC software packages, such as:
    - RT11
    - Fortran/RT11
    - Basic/RT11
    - Multi-user Basic/RT11
    - Focal

### NOTE:
*Terminals for the MF-211, such as video terminals, printers, etc. can be obtained from DEC or local distributors. Terminals must have either RS232 interface or 20ma current loop interface.*



## CONTROLLER CARD

The MF-211 controller card is unique in many respects. It is the *only controller in the industry* which contains all controller, interface, bootstrap loader and formatter electronics on a single dual-height card. In addition, it provides complete software/media compatibility with the RX02 DEC floppy-disk system.

# KD11HA LSI-11/2 MICROPROCESSOR

The 16-bit LSI-11/2 is DEC's standard microprocessor, offering an extensive instruction set, addressing up to 30K words, and automatic priority interrupt structures which simplifies programming. The asynchronous bi-directional bus structure allows for easy addition of peripherals and system configuring.

The LSI-11/2 is by far the most popular and familiar processor in the industry, supplemented by many years of developed software packages.

## NOTE TO USER:
*The LSI-11/23, with yet more advanced features, is directly useable in the MF-211 backplane.*

## DUAL FLOPPY DISK SYSTEM

The Shugart SA800 floppy disk drive series consists of read/write electronics, drive mechanism, read/write head, and track positioning mechanism. This ultra-reliable drive system offers soft error rates of one per $10^9$ bits read, and hard error rates of one per $10^{12}$ bits read, with MTBF of 5000 POH under heavy usage. The Shugart SA800 series is the industry standard floppy disk system with far more drives in the field than any other flexible disk system.

## ENCLOSURE FEATURES

The MF-211 enclosure is designed for easy access and simplified component replacement. The front panel is easily removable and modules, such as the LSI-11/2, MOS memory card, DLV-11 cards, etc are front panel accessible, plugging directly into the H9270 4-quad slot backplane (or optional 8-quad slot backplane). The backplane card cage can be pivoted upward to allow for easy access to the system's floppy disk drives. In the event of malfunction, any defective sub-assembly can be easily identified, removed and replaced, thus greatly reducing MTTR. Designed into

an attractive enclosure, the MF-211 can be slide-rack mounted or used in table-top applications. Two internally mounted fans provide abundant air cooling.

## MF-211 SYSTEM SPECIFICATIONS
Cabinet dimensions: 10.5"H x 19"W x 22"D
Power consumption: 4 amps (with LSI-11/2 & 32K words)
Operating temperature range: 15°C (59°F) to 32°C (90°F)
Relative humidity: 10% to 80% non-condensing

## LSI-11/2 MICROPROCESSOR
Word size: 16 bits
Addressable memory: Up to 30K words
Number of general registers: 8

## FLOPPY DISK SYSTEM
Storage media: IBM 3740 format 8-bit bytes sector
    Single density . . . . . . . . . . . . . . . . . . . . . . . . . 128
    Double density . . . . . . . . . . . . . . . . . . . . . . . . 256
Sectors/track . . . . . . . . . . . . . . . . . . . . . . . . . 26 (1 to 26)
Tracks per diskette . . . . . . . . . . . . . . . . . . . . . 77 (0 to 76)
Format . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . IBM 3740
Command status
    Register (RXCS) address . . . . . . . . . . . . . . . 777170
Interrupt vector address . . . . . . . . . . . . . . . . . . 264
Data buffer transfer . . . . . . . . . . . . . . . . . . . . . DMA

## ACCESS TIME AND RATES
Diskette to controller buffer: . . . . . . . . . . 32 $\mu$s/byte (SD);
                                  16 $\mu$s/byte (DD)
Buffer to CPU: . . . . . . . . . . . . . . . . . . . . . . . . 16 $\mu$s/byte
Track to track: . . . . . . . . . . . . . . . . . . . . . . . . 6 ms
Seek settle time: . . . . . . . . . . . . . . . . . . . . . . 14 ms
Head load time: . . . . . . . . . . . . . . . . . . . . . . . 41 ms
Rotational speed: . . . . . . . . . . . . . . . . . . . 360 RPM ±2.5%
Average access (25 track seeks and
    rotational latency): . . . . . . . . . . . . . . . . 320 ms

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### Controller Functions
2901 microprocessor controller allows for total RX02 emulation plus additional intelligent functions.

### Bootstrap Loader
Allows for automatic loading of system diskette on power-up or when Init/Boot switch is activated. The MF-211 bootstrap loader eliminates need for the BDV-11AA boot function, thus saving in both cost and backplane space.

### Single and Double Density Operation
Detailed instructions for use and conversion of single and double density operation are provided in the MF-211 instruction manual provided with each system.

### IBM 3740 Formatter
Using a simple procedure as described in the MF-211 instruction manual, any user can quickly format any diskette with the IBM 3740 headers, a feature not available on the RX02 flexible disk system.

### Self-Diagnostic
The MF-211 self-tester simplifies diskette and system maintenance and diagnosis.

### DMA Data Transfer
Emulating RX02 operation, the MF-211 provides DMA data transfer on a per sector basis.

### Software/Instruction Set Compatibility
Software written for use with the RX02 can be used with the CRDS MF-211 without modification, and with complete interchangeability of diskettes.

## RECORDING TECHNIQUE

Method: . . . . . . . . . . . . . . . . . FM (SD), MFM modified (DD)
Maximum bit density: . . . . . . 3200 BPI (SD), 6400 BPI (DD)
Track density: . . . . . . . . . . . . . 48 TPI
Surfaces: . . . . . . . . . . . . . . . . 1

## RELIABILITY

Seek error rate: . . . . . . . . . . . . . . . . . . . . . . . 1 in $10^6$ seeks
Soft read error rate: . . . . . . . . . . . . . . . . . . . 1 in $10^9$ bits
Hard read error rate: . . . . . . . . . . . . . . . . . . 1 in $10^{12}$ bits

## SYSTEM TEST PROCEDURE

Each MF-211 system is subjected to a thorough test procedure prior to shipment. The CRDS controller card receives comprehensive in-circuit diagnosis down to the device level via the in-house Test Line 4000 bed-of-nails tester. Each card also is subjected to 48 hours of temperature cycling (10F to 165F). The composite MF-211 system is configured with customer ordered components and receives final test, using appropriate LSI-11 system diagnosis.
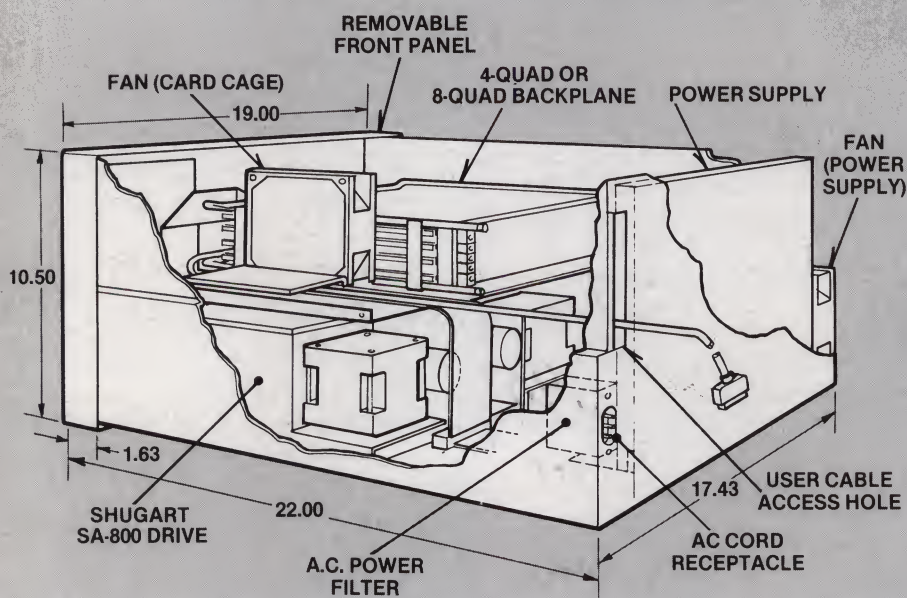
## DOCUMENTATION

An instruction manual is included with each MF-211 system and gives the user all needed information on specifications, installation, system configuration, general operation and preventive maintenance procedures. Detailed procedures are included for:

- Bootstrap loader
- Self-test function
- Creating Dy-based double density diskette from single density diskettes.
- Use of IBM 3740 formatter

The DEC Microcomputer Processors Manual and Memories and Peripherals Manual are also included with each MF-211 system. Additional manuals can be purchased on request.



LAYOUT DIAGRAM, MF-211 ENCLOSURE

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**TO ORDER YOUR MF-211 SYSTEM**
**simply indicate the needed items below on your order form.**

**MF-211, with LSI-11/2; and either 16K or 32K words.**

____KEV-11 extended arithmetic unit
____DLV-11 serial line unit
____DLV-11J quad serial line unit
____Cable for serial line unit: RS 232
____Cable for serial line unit: 20 ma current loop
____DRV-11 parallel interface
____Cable for DRV-11
____Other

**Software**

____RT-11
____Basic/RT11
____Fortran/RT11
____Other